RADIO

Bush Search and Rescue members are expected to be competent in the use of both Police and CB radios and be able to demonstrate the following:

- Knowledge of types of radio systems
- Use of BSAR and Police radios
- Specific radio controls on CB and Police radios
- Radio checks required prior to leaving the search base
- Send and receive radio messages
- Knowledge of call signs
- Use of pro-words
- Use of the phonetic alphabet
  Send, receive and record grid references

Reference

BSAR Manual Ch 11 – Additional Skills - Communications Section P82-90

RADIO SAFETY INSTRUCTIONS

- **Do NOT operate any radio in an explosive atmosphere**
- **Obey "Turn Off Two-way Radio" instructions eg at petrol stations, hospitals, etc**
- **Do NOT touch the antenna when transmitting**
- **Do NOT transmit when the antenna is missing or damaged**

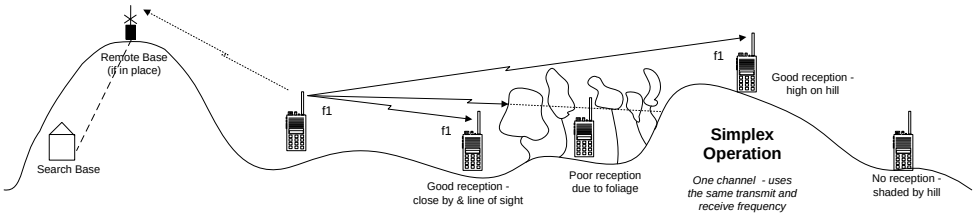
Acknowledgements

Use of the Victoria Police radio instruction sheet is acknowledged in developing parts of this set of instructions. The radio images are courtesy of Simoco and Uniden while the radio system diagrams are courtesy of Rik Head.

Radio System Types

There are two basic types of radio systems, conventional and trunking systems and within conventional systems there are two modes: simplex and repeater operation.

Simplex – a conventional radio system

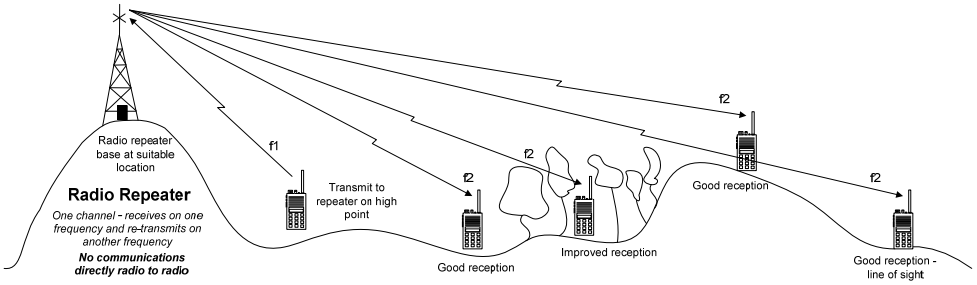


- Simplex channels use a single frequency (f1) for transmit and receive and allow direct communications between one radio and all other that are within range. Simplex coverage is line of sight only. It will not go over hills and in the bush is normally limited to 1-2km
- In a BSAR scenario simplex is used with UHF CB radios on a line search, around the search base or to an adjacent search group

Remote Base

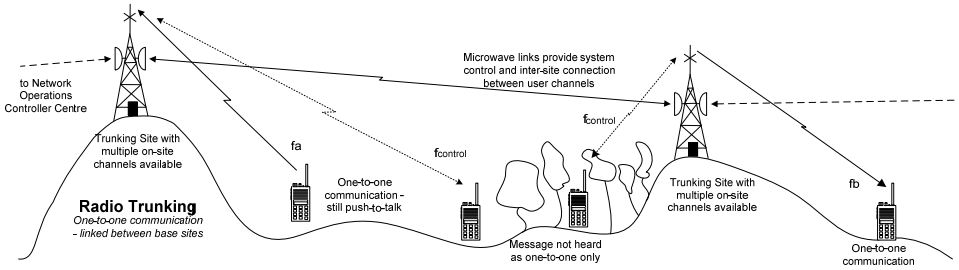
- A remote base is a simplex radio located at a high location linked back to the search base, often by another radio channel

Repeater – a conventional radio system



- Repeater communication uses a channel with separate frequencies for transmit and receive via a radio repeater located on a nearby high point
- From a BSAR perspective this could be a local Police repeater or a UHF CB repeater channel (Ch 1-8)
- A repeater improves coverage range within an area by being located in a high location
- All other radios within range of the repeater will hear all traffic
- When out of range of the repeater a radio cannot communicate with any nearby radios as the radios transmit and receive of different frequencies eg all the hand held radio transmit of f1 and receive of f2
- To check if you are in range of a repeater push the PTT for 2 seconds and listen for the sound of a repeater tail ie the radio squelch/mute opens and the closes a short time later

Trunking Radio Systems


to Network Operations Controller Centre
Trunking Site with multiple on-site channels available
Radio Trunking
One-to-one communication - linked between base sites
fa
fcontrol
One-to-one communication - still push-to-talk
Microwave links provide system control and inter-site connection between user channels
fcontrol
Message not heard as one-to-one only
Trunking Site with multiple on-site channels available
fb
One-to-one communication

- Trunking, depending on the system, is a normally a one-to-one communication that is not heard by other users, even if nearby
- Trunking is where a pool of radio channels at a number of sites are managed by a central Node Operations Centre Controller. When communications are required between two users a talk group channel is allocated for the duration of the conversation and then returned to the pool ready for use by other users, similar to telephone trunk lines
- Technically, all radios in the field monitor a control channel which instructs specific radios to and switch to a voice channel when communication user is required
- The analog State Mobile Radio (SMR) network is used by the Victoria Police and other Government agencies throughout Victoria and may be used by BSAR in a search situation

BSAR UHF CB Radios

General Notes

- Most UHF CB radios have the mute or squelch function that is automatically set
- The 2w radios use high capacity alkaline batteries such as Duracell, Energizer, provided by BSAR
- In the BSAR environment **DO NOT** use channels 1, 2, 3, 4 , 5, 6, 7, 8, 11, 22, 23, 31, 32, 33, 34, 35, 38, 37, 38, or 40 unless specifically instructed
- If there is other traffic on a channel, after consultation with the FO or your Group Leader, select another channel
- Radios can be set to HI, Medium of LO transmit power. Always ensure the radio is set to HI power
- Functions such as CTCSS and DSC are not used to keep it simple and to ensure compatibility with CB radios brought to a search by individual members
- In the field environment each line-search group may require a separate channel for line coordination
- UHF CB radios operate on public radio channels hence anything you say may be heard by anyone listening

BSAR UHF CB Radio Uniden Models

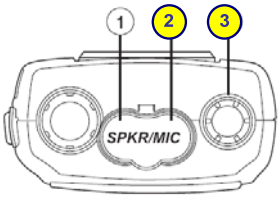
There are currently three models of Uniden radios that have 2w output used by BSAR as the standard for radio communication within a search group.

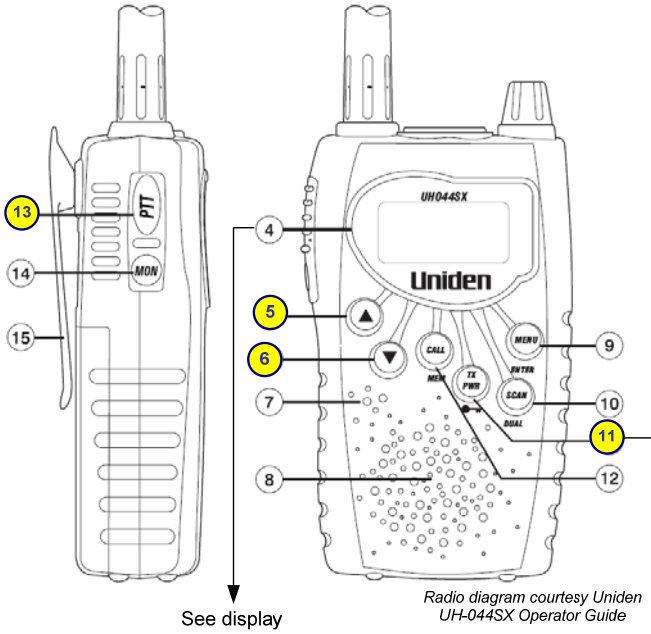
In addition, there are a small number of 5w Uniden radios for use as a radio relay or for group leader inter-group communications.

Every BSAR search team member should be equipped with a BSAR UHF CB radio. Privately owned radios that do not have the 2w transmit capability should not be used on a search.

To master reset a Uniden radio hold down SCAN & MEM together whilst turning unit ON. The display will scroll through all options repeatedly - turn off then on again after at least one cycle.

Uniden UH-044SX 2w radio





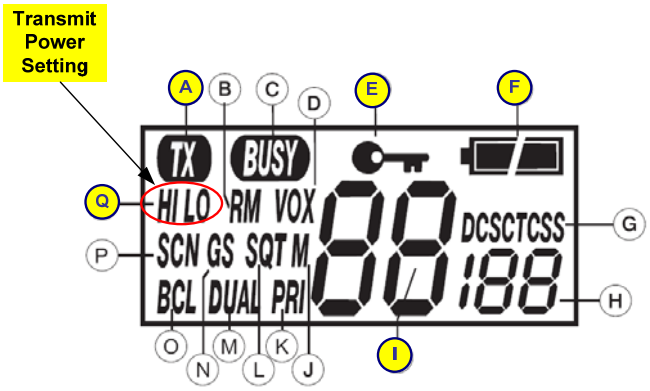
1. Charge Jack
2. **EXT SPKR/MIC Jack**
3. **On/Off Volume**
4. LCD Display
5. **Up Button**
6. **Down Button**
7. Microphone
8. Speaker
9. Menu/Enter Button
10. Scan Mode/Dual Watch Button
11. **Transmit Power Select/Keylock**
12. Call Tone Transmit/Memory On/Off Button
13. **PTT (Push-to-talk) Button**
14. Monitor Switch
15. Belt Clip

Key Lock – hold button down for 2 seconds

Do **NOT**
- use Lo Tx power
- use VOX

Radio diagram courtesy Uniden UH-044SX Operator Guide

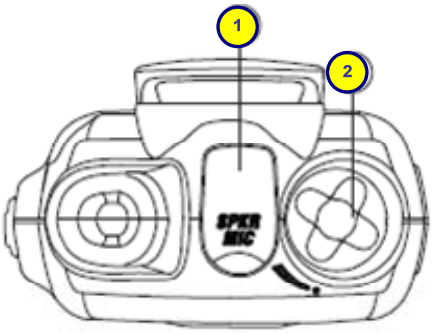
The display for the UH-044SX and the UH-065SX are the same

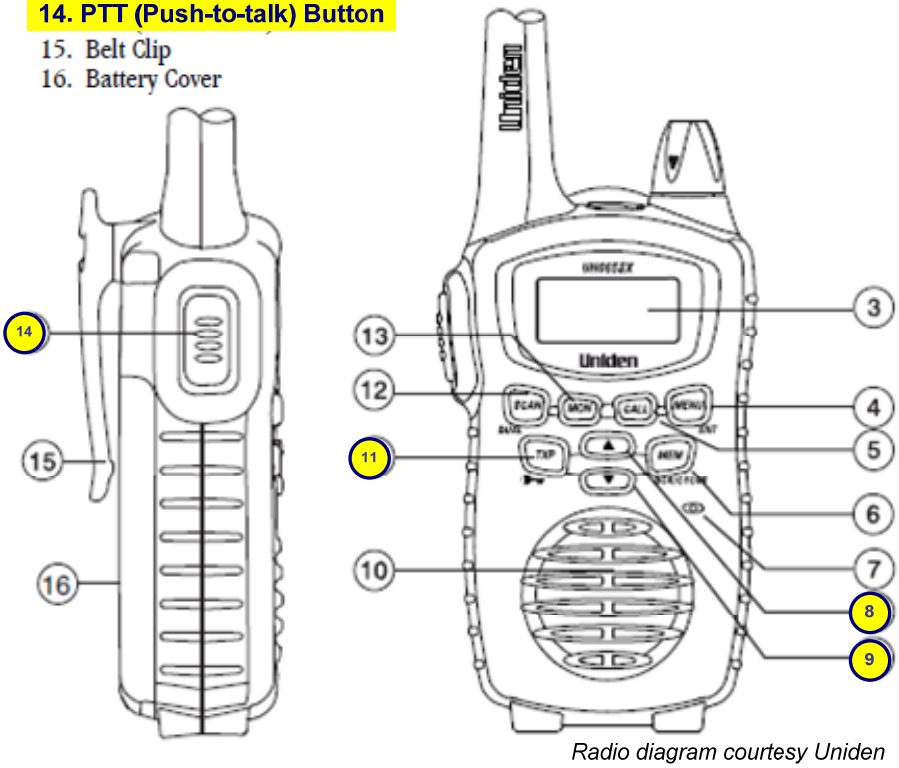


A. Transmit
B. Room Monitor
C. Busy
D. Voice Activation
E. Key Lock
F. Battery Level Indicator
G. DCS/CTCSS Indicator
H. DCS/CTCSS code
I. Channel Number
J. Memory
K. Priority
L. Squelch
M. Dual Watch
N. Group Scan
O. Busy Channel Lockout
P. Scan
Q. Power Level Indicator (High/Low)

Uniden UH-065SX 2w radio

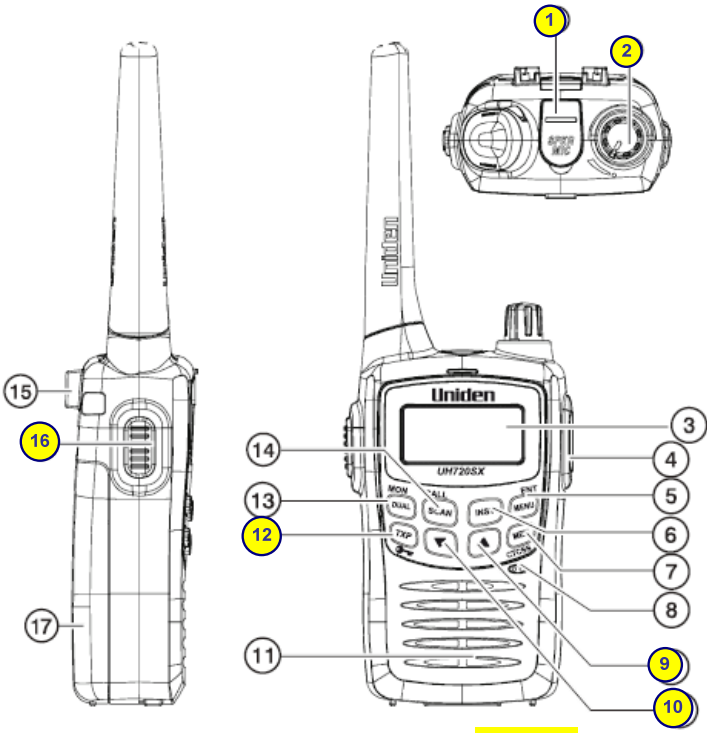
1. **EXT SPKR/MIC Jack**
2. **On/Off Volume**
3. LCD Display
4. Menu/Enter Button
5. Call Tone Transmit Button
6. Memory On/Off & DCS/CTCSS Button
7. Microphone
8. **Up Button**
9. **Down Button**
10. Speaker
11. **Transmit Power Select/Keylock**
12. Scan/Dual Watch Button
13. Monitor Button
14. **PTT (Push-to-talk) Button**
15. Belt Clip
16. Battery Cover





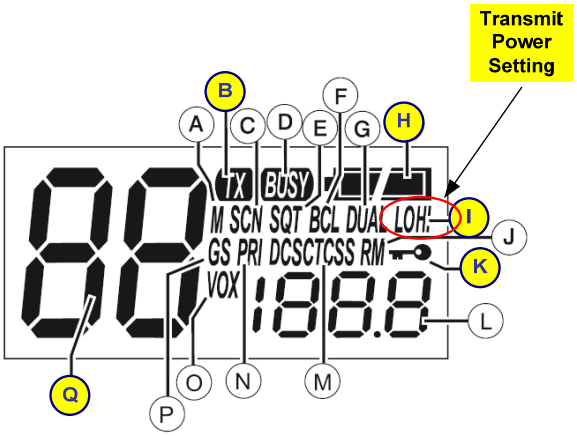
Radio diagram courtesy Uniden UH-065SX Operator Guide

Uniden UH072sx 2w radio



1. Ext Speaker/Mike
2. ON/OFF Volume
3. LCD Display
4. Cigarette Lead Charger Ja
5. Menu/Enter Button
6. Instant Button
7. Memory On/Off & DCS/CTCSS Button
8. Microphone
9. Up Button
10. Down Button
11. Speaker
12. Transmit Power Keylock select Button
13. Dual Watch/Monitor Button
14. Scan/Call Tone Transmit Bu
15. Belt Clip Catch
16. PTT Button
17. Battery Cover

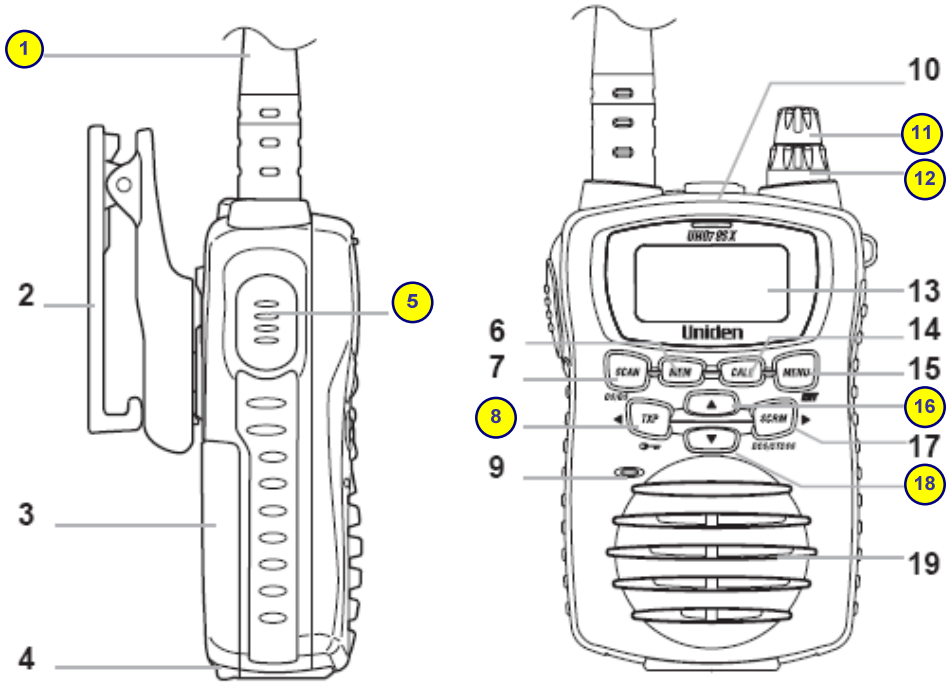
Radio diagram courtesy Uniden UH-072SX Operator Guide



A. Memory
B. Transmit
C. Scan
D. Busy
E. Squelch
F. Busy Channel Lockout
G. Dual Watch
H. Battery Level Indicator
I. Transmission Power Level Indicator (High/Lo
J. Room Monitor
K. Key Lock
L. DCS/CTCSS code
M. DCS/CTCSS Indicator
N. Priority
O. Voice Activation
P. Group Scan
Q. Channel Number

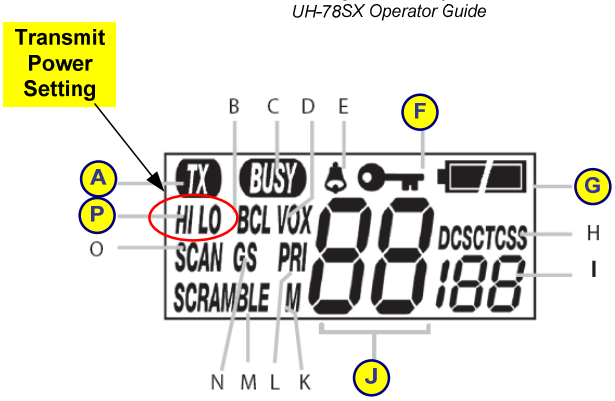
Uniden UH078SX Deluxe 5w radio

The UH078SX is a 5w radio with a detachable high gain antenna. The primary use of these radios is as a radio relay or for group leader inter-group communications.
This radio only uses dedicated rechargeable batteries supplied with the radio.



Radio diagram courtesy Uniden UH-78SX Operator Guide

1 Antenna
2 Belt Clip
3 Battery
4 Battery Release Clip
5. PTT Button
6 Memory Key (MEM)
7 Scan Key (SCAN)/ Open Scan/Group Scan
8 TXP Power/Lock Key
9 Microphone
10 Speaker MIC Jack
11. ON/OFF Vol Knob
12 Squelch Knob (SQ)
13 LCD Display
14 Call Tone Key (CALL)
15 Menu/Enter Key (MENU/ENT)
16 Channel UP Key
17 Scramble/DCS/CTCSS/▶ Key
18 Channel Down Key
19 Speaker

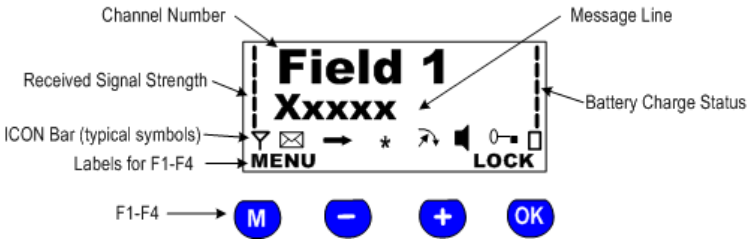


A Transmit
B Busy Channel Lock Out
C Busy
D Voice Activation (VOX)
E Roger Beep
F Key Lock
G Battery Level Indicator
H DCS / CTCSS
I DCS / CTCSS Indicator
J Channel Number
K Scan Memory
L Priority Channel
M Scramble
N Group Scan
O Scan
P HI/LO Transmit Power

Field Organisers must to ensure these radios are charged en route to a search using the car charger supplied A cigarette lighter double adapter allows the charging of multiple radio. When at search base the 240v charger can be used.

Police Simoco SMR/Conventional Radio

Display



- Police SMR radios operate on VHF High Band so their coverage is normally better than UHF CB radios in the bush but they are still generally line-of-sight
- Police Simoco radios can change their personality from a conventional radio (simplex or repeater channels) to a trunking radio
- A Police SMR radio can only be a conventional radio or a trunking radio at any one time, not both
- In Trunking mode Police radios are similar in use to a mobile phone
- Battery and received signal strength are shown in the display
- You only have a short time to complete your call
- Remember only one person can talk at a time

Switching between Conventional and Trunking

- If in conventional, unlock the radio (press the OK key for 3 seconds)
- Press the Mode key (F5) and toggle to the required mode:
  - ***Conventional*** (Police channels)
  - Personality 1 "***Vicpol SMR***" (trunking)
  - Personality 2 "***VP Grp Ops***" (not used)
- The radio will then restart with the selected personality and display either its current channel or its SMR ID

Use as a Conventional Police Radio

Auto Lock
Keypad will auto lock after 10 sec

Conventional Channels
Channels available in Conventional Mode are:

- **RWD2 L1, RWD2 L2, RWD3 M1, RWD4 M2, RWD5 O1, RWD6 N1, RWD6 N2, Red3 P2, RED4 P1, RED5 Q1, RED6 Q2** country Regional/Divisional wide-area channels
- **Field 1 – 4** portable repeater channels – normally used on bush searches
- **Cell 1 - 4** for in-vehicle repeater operation – not used for searches

To select a Channel

- Unlock radio – Hold OK for 3 sec
- Use +/- keys to toggle through and select channel
- Keypad will auto lock in 10 sec

Scan Symbol

The radio is scanning a group of channels in conventional mode or is looking for a control channel when in trunking mode

Use as a Police Trunking Radio

Radio Number

- When used in trunking each radio has a ***Prefix Number + Fleet Number + Unit ID***. Police radios normally require use of the ***Fleet Number + Unit ID***. For communication between radios in the same Police Fleet only the ***Unit ID*** is required

- Victorian Government Department and other Users are allocated separate Prefix Number eg VicPol is 232, CFA is 240, VIcRoads is 234, DSE is 230, Ambulance is 242, etc

- Within VicPol there are a number of Fleet Numbers based on Police Regions/Divisions and other specialist groups

- A typical Police complete radio ID would be 232 + 4801 + 456 where 456 is the Unit ID

Display

- When ***SMR 4801 456*** is displayed the radio is logged on to the trunking system and ready for use, where 456 is the radio ID
- ✉ There are one or more stored (missed) calls
- Each call is limited to 3 minutes – the time used in seconds is displayed for each call

To make a call

- Enter ***Unit ID*** ** see Radio Number section above
- Press OK or press the PTT
- The radio will operate like a mobile phone. There will be ring tone, engaged tone and timeout on no answer

To answer a call

- Press the PTT
- Commence your conversation. **Remember:** only one person can talk at a time

To end a call

- Press Clear (key F6)
- or you can wait for the call to timeout after 3 minutes

Last Number Recall

- Press # twice

Stored (Missed) Calls

The radio will **beep** every few seconds and display the missed call Icon ✉

- Press M key
- Press +/-
- A stored call is displayed
- Press OK
- Press +/- to scroll missed calls
- Press OK to select the missed call
- To **delete**, press OK again to display the missed call menu and follow the instructions

Emergency

While in trunking in case of emergency press the orange Emergency button on the top of the radio to talk to the Emergency Operator for Triple Zero.

Useful Trunking Radio Hint

When moving from one area to another and your reception from a particular base site gets worse try turning the radio ***Off*** then ***On*** again so that it is forced to scan for the nearest strongest site at your new location

Checks by the radio operator prior to leaving Search Base

Always check:

- You have a full or new battery
- You have spare batteries or battery pack
- The radio is on the correct channel and you have noted that channel
- The radio is set to **high power**
- You know the callsign of base and other radios on the network
- The radio is operational by a test transmission to base or another nearby radio
- The group leader has a contingency plan in case your radio communications does not work in the field

Sensitive Messages

- Care should taken in the sorts of message communicated by radio if they involve finding of lost person, especially if they are deceased
- Remember family members and the press are often around the search base and can hear radio traffic

Call Signs

- Call signs allocated vary depending on the circumstances and the radio networks being used
- Typically BSAR will use BSAR1, BSAR2… for search groups, BSAR Base for the search base, BSAR FO for the Field Organizer, or the person's name, etc
- The Police base is normally VKC1…6
- Other Police units have call signs such as Rescue 200, Morwell 201, Air 490, etc.
- Other agencies are normally use their normal callsign or may be allocated specific call signs such as SES1, Horse Riders 1, etc as the need arises
- When communicating using UHF CB radio within a search group it is recommended that the individual's first name be used as a callsign while communications between groups should use the official allocated callsign
- In circumstances where a long conversation is required with another unit and you have good clear communications, the need to use full callsigns on every transmission during the conversation is reduced. When reception is difficult always use call signs

Useful Radio Hints

- Engage brain prior to engaging your mouth
- Speak slowly and clearly
- Keep messages **short**, **simple** and **precise**
- Ensure the press-to-talk button has been fully depressed before beginning to speak
- The microphone generally should be held close to the mouth similar to a mobile phone but with speech slightly louder than normal conversation. Do not whisper or shout
- Write down important messages and grid references being communicated or messages being relayed to another group
- **High** and **clear**: you may need to move to a higher up a hill or get clear of thick bush for your message to be received. Remember, your body can absorb a significant amount of signal
- Avoid damage to your radio and do not loose it. It is very easy for it to become unclipped when walking through the bush
- Batteries do not last as long in the cold, it may be necessary to keep your radio close to your body for warmth in very cold conditions
- Do not send unnecessary messages, especially when the communication or environmental conditions make the task difficult

Pro Words

Pro-words or code words are words with an agreed meaning that facilitate effective communications.

- "This is" – the callsign you are calling "this is" your callsign – you hear your callsign and start listening for the callsign of the group that is calling you
- "Over" – I have finished transmitting and expect a message in response
- "Out" – I have finished transmitting and do not expect a response
- "Standby" – stay listening I will get back to you shortly
- "Romeo" - confirmation that a message has been received and understood

  Example: *BSAR2* ***this is*** *BSAR1* ***Over***
  BSAR1 ***this is*** *BSAR2 we will arrive shortly* ***Over***
  BSAR2 ***this is*** *BSAR1* ***Romeo Out***

- "Affirmative" – Yes, or that is correct, or permission is granted
- "Negative" – No, or that is incorrect, or permission is not granted
- "Say again" – I did not receive or understand your message (do not use the word Repeat)
- "I spell" for a word to be spelt out using the phonetic alphabet

  Example: BSAR1 ***this is*** *BSAR3 the location is Big Hill* ***I Spell*** *Bravo India Golf Hotel India Lima Lima* ***Over***
  BSAR3 ***this is*** *BSAR1 Big Hill* ***Romeo Out***

- "Figures" as a prefix for a figure sequence except for times and grid references

  Example: BSAR1 ***this is*** *BSAR2 the mobile phone number you require is* ***figures*** *0409 111 345* ***Over***

- "Grid Reference" – 6 digit reference for less important information, record the info

  Example: BSAR Base ***this is*** *BSAR4. We have stopped for lunch at the creek junction,* ***Grid Reference*** *357 295* ***Over***

- "GPS Grid Reference" – a full 14 digit reference with datum and zone for important locations, record the info

  Example: BSAR Base ***this is*** *BSAR6 I have found a footprint at* ***GPS Grid Reference*** *GDA94 55H 0349955 5807933* ***Over***

- "Red Red Red" is only used to prefix a message when you have real emergency traffic during a training exercise

- "Relay" used where a message is to belayed to another group

- Times should be sent using the 24 hour clock

  Example: BSAR Base ***this is*** *BSAR4 we will arrive back at search base at zero nine thirty five hours* ***Over***

- Radio signal strengths should be described in terms of:

Loud and Clear	Readable	Weak
Unreadable	Not Heard	Breaking
Distorted		

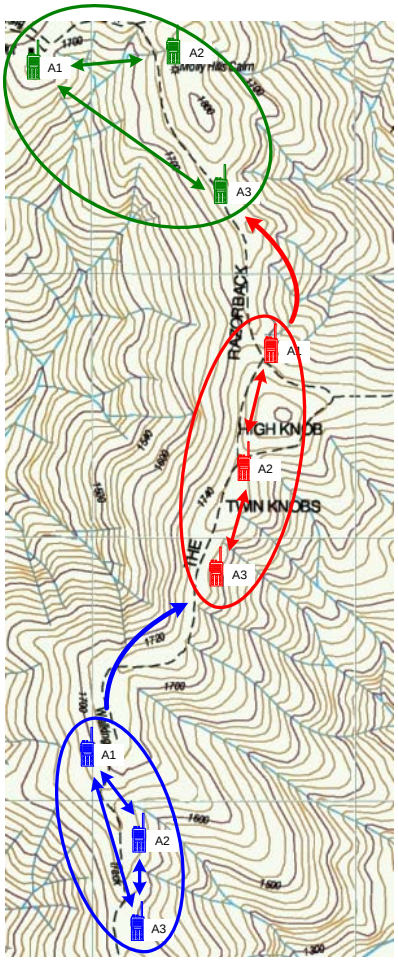
Phonetic Alphabet

A	Alpha	J	Juliet (JULiett)	S	Sierra
B	Bravo (BRAHvo)	K	Kilo (KEElo)	T	Tango
C	Charlie	L	Lima (LEEma)	U	Uniform
D	Delta	M	Mike	V	Victor
E	Echo	N	November	W	Whisky
F	Foxtrot	O	Oscar	X	X-ray
G	Golf	P	Papa	Y	Yankee
H	Hotel (HOEtel)	Q	Quebec (KWIbeck)	Z	Zulu
I	India	R	Romeo		

Peer-Track Radio Network

Use of this type of network may be appropriate under some circumstances

Peer-Track radio networking is a moving peer-to-peer simplex radio net that allows groups to track one another as they move through an area. It is only likely to be used when beyond the range of base communication facilities normally provided by Police or other radio systems.



Peer-Track works by each moving group broadcasting their current location on a regular basis or at specific landmarks. This information is received, recorded and acknowledged by other groups within radio range.

Using this tracking method the location of each group should be known to at least one other group at all times. This then allows messages to be passed between any two groups. When they are not within direct radio range a radio relay (or two) may be required.

Using a Peer-Track network does require each group's radio operator to constantly monitor the radio channel and to be aware when they need provide a relay link between groups to pass a message.

Differences between Police and DSE Simoco Radios

There are circumstances where searchers may be asked to use Department of Sustainability and Environment (DSE) trunking handheld radios (Simoco SRP9100 plus).

DSE also use the Victorian Government SMR system. However, DSE radios have some differences from the Police configuration, particularly when used as a trunked radio.

Trunking Mode Differences

No Auto Key Lock

- There is no auto key lock function on DSE radios

No Emergency Button

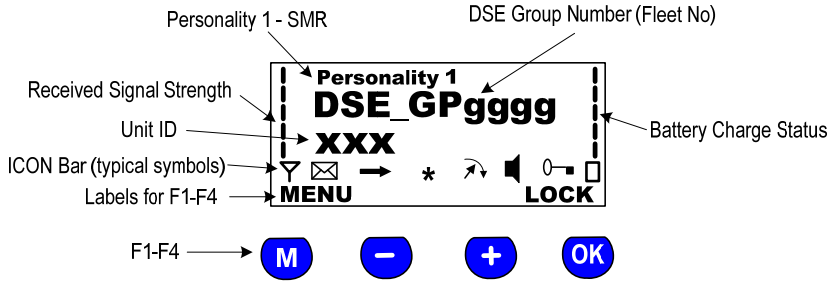
- There is no emergency button programmed into DSE radios. Hence, F6 is not used for an "emergency"

Personality Change

- The F6 button is used as the "personality change" button. When ***pushed twice*** (F6 F6) it toggles the radio between Conventional and Trunking
- There is only one trunking personality in DSE radios (Personality 1)
- The DSE personality can also be changed using the method described for Police radios

Fleet Number display

- DSE radio default trunking display shows the fleet ID ie the DSE group not "SMR" in the group name eg a typical DSE radio could show DSE_GP2345



- *Remember:* If all radios being used are in the same Fleet then only the 3-digit Unit ID is required to call another radio

Push to Talk

- Cannot use OK as a substitute for push to talk – only the PTT button on the radio or the extension mike/speaker

Call Cancel

- Use either ***Call Cancel*** (F5) or ***** then **#** to cancel a call

Last Number Redial

- This is the same on both Police and DSE radio configurations – press ***# twice***

Conventional Channel Differences

Auto Key Lock

- There is no auto key lock function on DSE radios

Separate Conventional Channels

The conventional channels used by DSE are different to those used by Police

Document History

Notes by Rik Head
Derived from alpineSAR Radio Competency C003

Release	File Name	Based on alpineSAR	Details
V1	BSAR Radio V1 Sep08	C003 1.1 Sep08	Initial release version
V2	BSAR Radio V2 Nov08	C003 2.0 Nov08	Initial release version
V2.1	BSAR Radio V2.1 Nov08	C003 2.1 Nov08	Tidy ups
V2.2	BSAR Radio V2.2 Jun09	C003 4.0 Jun09	Use of DSE trunking includes
V2.3	BSAR Radio V2.3 Oct09	C003 4.2a Oct09	Callsign usage, acknowledgements, etc
V2.4	BSAR Radio V2.4 Oct09	C003 4.3 Oct09	Update VP SMR Radio functionality
V2.5	BSAR Radio V2.5 Jan10	C003 5.0 Jan10	Add additional Uniden radios
V2.6	BSAR Radio V2.6 Aug10	C003 5.1 Aug10	Add master reset instr for Uniden radios Update Police regional channels